Improvement of buckling restrained round steel bar dampers for beam-to-column connections

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Abstract

During a severe earthquake, the significant amount of energy is input to a structure and possibly causes structural damage. Because some of the input seismic energy can be dissipated by the dampers, extensive researches on the dampers have been conducted for mitigating seismic damage of structures. A recent study [1] proposed the buckling restrained round steel bar dampers installed at the beam-to-column connections. Some cyclic loading tests revealed sufficient energy dissipation capacity of the dampers. It was observed, however, that some slippage appeared in the load-deformation relationships and strength deterioration occurred due to the damage of the screw in the dampers.

This study investigates improvement of the round steel bar dampers to overcome the unfavourable behaviour observed in the previous loading tests. In the revised type of the round steel bar dampers, the diameter of the bar shank was reduced to avoid plastic deformation of the screw parts. The previous study [1] used the dampers in which the diameter of the bar shank was 22 mm. By contrast, this study used the dampers with 18 mm and 16 mm diameter bar shanks. The cyclic loading tests exhibited the preferable behaviours in the beam-to-column connections with the revised type of round steel bar dampers. In addition to the loading tests, some finite element analyses were conducted for the steel bar dampers. The analysis results showed good agreements with the loading tests and revealed characteristic deformation configuration such as the spiral buckling mode in the round steel bars.

References

[1] Y. Nagoya, H. Tagawa, Study on beam-to-column connections with buckling restrained round steel bar dampers, Summaries of Technical Papers of Annual Meeting, Architectural Institute of Japan, Structures III, 733-734, 2017. (in Japanese)